



New records of *Gerrhonotus parvus* Knight & Scudday, 1985 (Squamata, Anguidae) in the state of Coahuila, México

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Abstract

We document the first records of *Gerrhonotus parvus* in the state of Coahuila, México. From March 2012 to March 2017, 6 males and 2 females were found in pine forest and submontane scrubland plant communities in the Sierra de Zapalinamé Natural Protected Area, which is located in the municipalities of Saltillo and Arteaga. These records extend the known distribution of the species 28–44 km west of the nearest occurrences in the state of Nuevo León.

Key words

Sierra Madre Oriental; submontane scrubland; pine forest; new records; *Gerrhonotus parvus*; Pygmy Alligator Lizard.

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Introduction

The genus *Gerrhonotus* Wiegmann, 1828 is endemic to North America and represented by 7 species: *G. farri* Bryson & Graham, 2010, *G. infernalis* Baird, 1859 (1858), *G. liocephalus* Wiegmann, 1828, *G. lazcanoi* Banda-Leal, Nevarez de los Reyes & Bryson, 2017, *G. lugoi* McCoy, 1970, *G. ophiurus* Cope, 1866, and *G. parvus* (Knight & Scudday, 1985). The distribution of the group is complex; the large species have wide ranges, and the small species are range-restricted (Fig. 1). The most widely distributed species are *G. liocephalus* in western and southern México and *G. infernalis* in central and northern México and southern Texas (Good 1994). The remaining 5 species have restricted distributions, known from small areas and only a few individuals. *Gerrhonotus*

ophiurus is distributed in central and southwestern San Luis Potosí, eastern Querétaro, Hidalgo, Tlaxcala, Puebla, and mountainous areas of northern Veracruz (Lemos-Espinal and Dixon 2013). *Gerrhonotus lugoi* occurs in the Cuatrociénegas basin, Coahuila (McCoy 1970) and the municipality of Mina, Nuevo León (García-Vázquez et al. 2016). *Gerrhonotus farri* is found near the town of Tula, Tamaulipas (Bryson and Graham 2010). *Gerrhonotus parvus* is known only from the state of Nuevo León, in the municipalities of Galeana, Los Rayones, Santa Catarina, and Santiago (Banda-Leal et al. 2013, Banda-Leal et al. 2014b). The most recently described species in the genus, *G. lazcanoi*, has only been found at 1 site near the Coahuila/Nuevo León border in the municipality of García, Nuevo León.

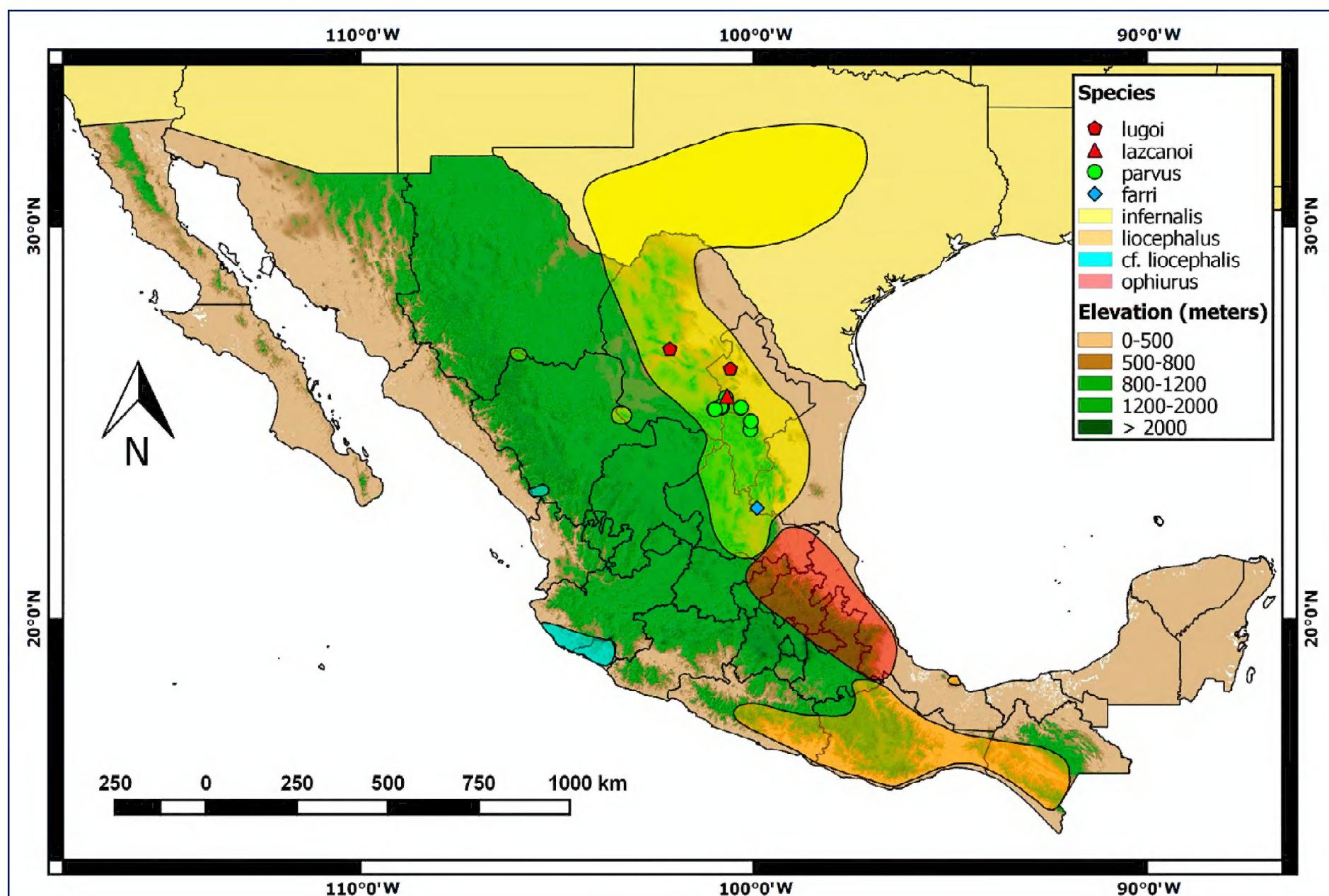


Figure 1. Map showing the known occurrence of genus *Gerrhonotus*. Polygons indicate wide distribution species. The yellows correspond to *G. infernalis*, red to *G. ophiurus*, orange to *G. liocephalus* and blues to *G. cf. liocephalus*. The symbols indicate local distribution species. Reddish pentagon corresponds to *G. lugoi*, red triangle to *G. lazcanoi*, green circle to *G. parvus* and blue diamond represents *G. farri*.

Relatively little is known about the biology of the last 4 species, *G. lugoi*, *G. farri*, *G. parvus* and *G. lazcanoi*. For *G. lugoi*, there is a report of reproduction in captivity, courtship, and litter size (Lazcano et al. 1993). For *G. parvus*, there is more detailed information about its natural history (Bryson et al. 2003), as well as its distribution, litter size, sympatric herpetofauna, and potential predators (Banda-Leal et al. 2013, 2014a, b, Banda-Leal 2016). *Gerrhonotus farri* and *G. lazcanoi* are known from a single specimen each (Bryson and Graham 2010, Banda-Leal et al. 2017).

Although known from several localities in Nuevo León, *G. parvus* remains an enigmatic species. It is a small lizard with a maximum total length (TL) of 130 mm for males (Banda-Leal et al. 2005) and 84.5 mm for females (Knight and Scudday 1985). This species differs from its congeners by a combination of morphological characters, including small adult size, smooth dorsal scales, nasals in contact with medial fifth supraocular, suboculars separated from lower primary temporal by an upper lip, and wide pale crossbands on the tail (Knight and Scudday 1985). *Gerrhonotus parvus* is known from the Sierra Madre Oriental in the state of Nuevo León (Fig. 2). The species was originally reported for the municipality of Galeana in a transition zone between pine forest (*Pinus arizonica*) and open gypsophyllous scrub at 1650 m above sea level. (Knight and Scudday 1985), and subsequently reported to the northwest

from the type locality, in the municipality of Santiago in Cañón de San Isidro (Banda-Leal et al. 2002). This canyon is at 1600 m above sea level, runs east and west, and is characterized by steep limestone walls covered with Agave (*Agave lechuguilla*, *A. bracteosa*), sotols (*Dasyllirion* sp.), and scrub oaks (*Quercus* sp.), and has intermittent pools of water. The canyon bottom has piles of leaf litter with scattered large rocks (Banda-Leal et al. 2002, Bryson and Lazcano 2005). Between the Galeana and Cañón de San Isidro sites, 1 specimen of *G. parvus* was found in the Cañón de Mireles in the municipality of Los Rayones, with a habitat similar to that of the Cañón de San Isidro, but at 900 m above sea level, the lowest record for this species (Conroy et al. 2005). Later, 1 specimen was found in the municipality of Santa Catarina, in Cañón de Reflexiones, northwest of the Cañón de San Isidro, both with very similar habitats (Banda-Leal et al. 2014b).

We surveyed a mountainous region in eastern Coahuila called the Sierra de Zapalinamé (Fig. 2). It is located to the south of Saltillo, Coahuila and was decreed as a natural protected area (ANP) in 1996 (DOF 1996). More than 40% of the water that supplies the city of Saltillo comes from underground aquifers (Marines-Gómez 2012), and its conservation is therefore essential for the city. The Sierra de Zapalinamé is near the city of Saltillo-Arteaga and serves as a refuge for biodiversity. With the help of the ANP personnel, we documented 8 specimens

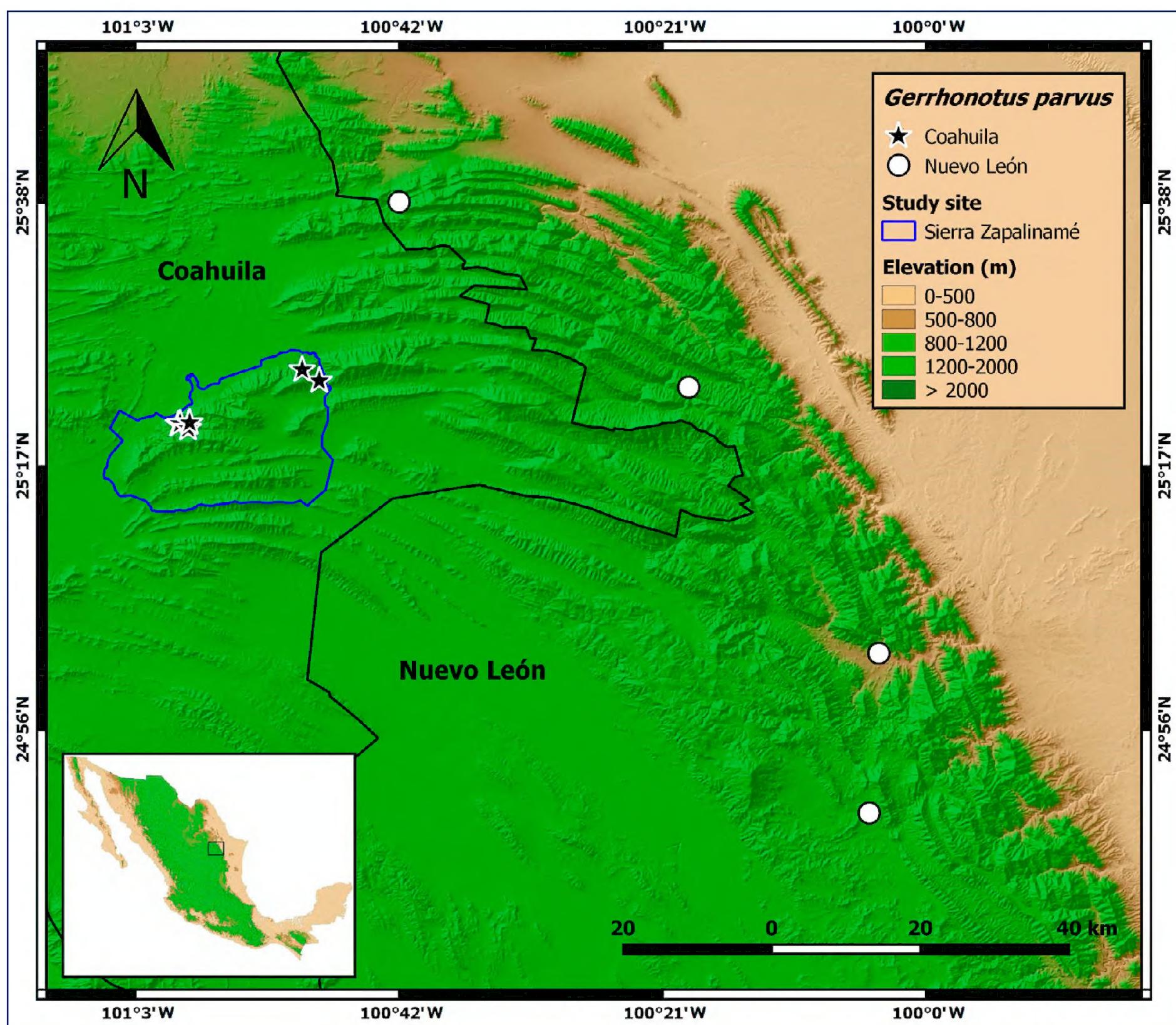


Figure 2. Distribution map of *Gerrhonotus parvus*. The white circles represent the known occurrence in Nuevo León. The black stars indicate the new localities where the specimens of *G. parvus* were found in the Sierra de Zapalinamé, Arteaga and Saltillo municipalities, Coahuila, México.

of *G. parvus* from the study region (Fig. 3). Here we provide results of our discoveries.

Methods

From June 2016 to August 2017, we visited each month the Sierra de Zapalinamé which presents a complex topography, composed of valleys, canyons, hills, and steep slopes ranging from the 1,700 to 3,100 m above sea level. Its vegetation types range from desert scrub, submontane grasslands, gallery oak, and pine forests. Canón de San Lorenzo is where most of the *G. parvus* were found, and it is one of the most diverse floral communities in the Sierra Madre Oriental. The following species are dominant: Sotols (*Dasylinion cedrosanum*), Chaparro Oak (*Quercus pringlei*), Little Bird Tree (*Lindleya mespiloides*), Evergreen Sumac (*Rhus virens*), and Alderleaf Mountain Mahogany (*Cercocarpus montanus*), with a rocky substrate with abundant crevices. In the Paraje Aguajes area, the principal vegetation is composed mainly of Chaparro Oak, Mexican Drooping Juniper

(*Juniperus flaccid*), Sotols, Lechuguilla Agave (*Agave lechuguilla*), Apark Palm (*Brahea dulcis*). In the Cerro de las Nieves II, the main plant elements are Sotols, Chaparro Oak, Little Bird Tree, and various species of grasses.

We searched for lizards in suitable habitat by means of active searching method. The specimens of *G. parvus* that were collected were deposited in the preserved herpetological collection of the Facultad de Ciencias Biológicas of the Universidad Autónoma de Nuevo León as catalog numbers UANL. We measured snout–vent length (SVL) and tail length (T_aL) (Vernier Helios, accuracy 0.05 mm), as well as body and environmental temperatures (RayTek ST30 Pro Enhanced), and the geopositioning (Garmin eTrex 20). Specimens were collected with permission of SEMARNAT (Secretaría del Medio Ambiente y Recursos Naturales y Cambio Climático), under the permit NUM/SGPA/DGVS/08377/16 to David Lazcano. Prior to our study, staff members of Sierra de Zapalinamé found and photographed 2 individuals of *G. parvus*.

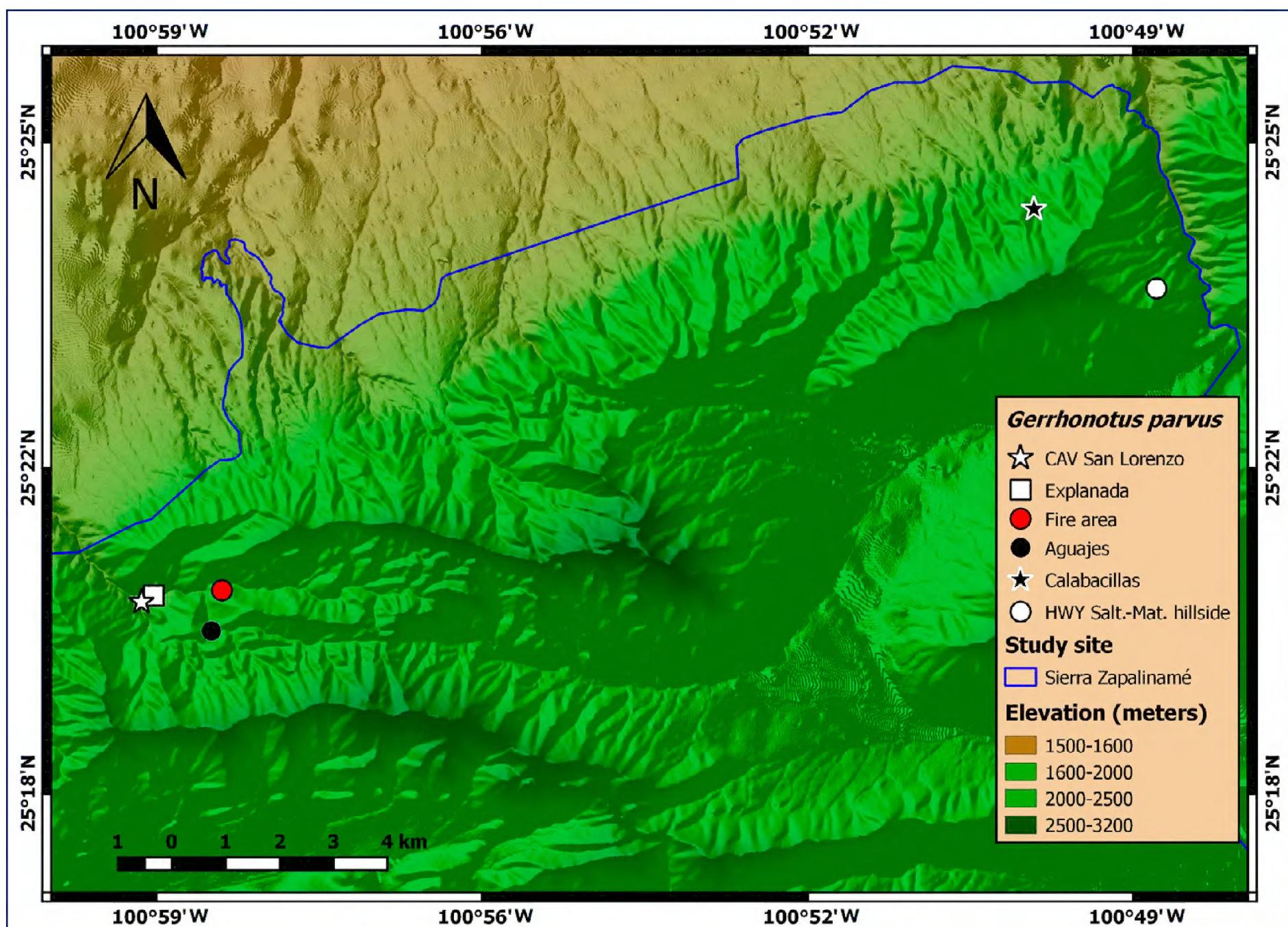


Figure 3. New records of *G. parvus* in the Sierra de Zapalinamé, Saltillo and Arteaga, Coahuila. The symbols indicate collecting sites. The white star correspond to Visiting Attention Center, the white box to La Explanada, the red circle to fire area, the black circle to Paraje Aguajes, black star to Cañón de Calabacillas, and white circle to slope off the road Saltillo-Matehuala.

Results

New records. Mexico: Coahuila, Arteaga, Sierra de Zapalinamé, Cerro de las Nieves II, side of highway Saltillo-Matehuala ($25^{\circ}23'35''$ N, $100^{\circ}48'20''$ W, WGS 84, 2210 m above sea level), 9 March 2012, Juan Manuel Cardenas-Villanueva and Rafael Cardenas-Olivier, collectors, 1 individual (photographic voucher). Mexico: Coahuila, Saltillo, Sierra de Zapalinamé, Cañón de San Lorenzo, Visiting Attention Center ($25^{\circ}20'07''$ N, $100^{\circ}59'34''$ W, WGS 84, 1910 m above sea level), 29 June 2015, Juan Manuel Cardenas-Villanueva collector 1 individual (photographic voucher). Mexico: Coahuila, Arteaga, Sierra de Zapalinamé Cerro de las Nieves II, in Cañón de Calabacillas ($25^{\circ}24'28''$ N, $100^{\circ}49'42''$ W, WGS 84, 2140 m above sea level), 11 July 2016, Arturo Cruz-Anaya collector, 1 individual (photographic voucher). Mexico: Coahuila, Saltillo, Sierra de Zapalinamé, Cañón de San Lorenzo, La Explanada, ($25^{\circ}20'11''$ N, $100^{\circ}59'26''$ W, WGS 84, 1920 m above sea level) 15 July 2016, Javier Band-Leal collector, 1 individual (UANL-7729) (Fig. 4). Mexico: Coahuila, Saltillo, Sierra de Zapalinamé, Cañón de San Lorenzo, Paraje Aguajes ($25^{\circ}19'48''$ N, $100^{\circ}58'48''$ W, WGS 84, 2065 m above sea level), 10 August 2016, Javier Band-Leal and Juan Manuel Cardenas-Villanueva collectors,

1 individual (UANL-7730). Mexico: Coahuila, Saltillo, Sierra de Zapalinamé, Cañón de San Lorenzo ($25^{\circ}20'15''$ N, $100^{\circ}58'42''$ W and $25^{\circ}20'15''$ N, $100^{\circ}58'40''$ W, WGS 84, 2120 m above sea level), 27 March 2017, José Efraín Ramírez-Briones and Arturo Cruz-Anaya collectors, 3 individuals (UANL-7733 and 7734), this specimens were burnt in a fire, the last specimen was found alive and was not collected (photographic voucher).

Identification. We examined all the collected and photographed material; and compared external morphology using the scale criteria for anguids (Good 1988), as well as the description of the species (Knight and Scudday 1985). In addition, the identification of specimens was confirmed by Robert W. Bryson Jr.

Discussion

Here we present the first records of *G. parvus* for the state of Coahuila, as well as for the western portion of the Sierra Madre Oriental. These records represent a total of 8 specimens found, of which 2 were collected alive, 2 that were collected as burned in a fire, and 4 observed alive in the field; with all of the specimens photographed. The 4 specimens collected in Coahuila added to the 12 of Nuevo León mentioned in the literature, bringing the total to 16 specimens in scientific collections (Table 1).



Figure 4. *Gerrhonotus parvus* (UANL-7729) from La Explanada area (photograph by Javier Banda-Leal).

The specimens from Cañón Calabacillas and Cerro de las Nieves along the Saltillo–Matehuala highway extend the range 28 km southwest of the previously known locality in Nuevo León. The specimen from Cañón San Lorenzo in the Visiting Attention Center is the most distant record, extending the range 44 km southwest of the previously published locality of Cañón de Reflexiones, Santa Catarina, Nuevo León. The lowest-occurring record is from Cañón de San Lorenzo in the Visiting Attention Center at 1920 m, whereas the highest-occurring record was from Cerro de las Nieves II at 2207 m. It is noteworthy that *G. parvus* was previously estimated to occur below 1600 m; however, all individuals from Coahuila primarily were found at elevations over 2000 m. It is possible that the species may have a similar vertical distribution in Nuevo

León, and that these areas can serve as refuges for climate change.

Gerrhonotus parvus is currently protected by national and international laws, is under special protection status by the (NOM-059-SEMARNAT 2010), and is also listed in the IUCN (2013) as Endangered under criteria B1ab(iii). The ecological characteristics of the areas in Coahuila are similar to those in Nuevo León, but the specimens are found at higher elevations. The area known as Cerro de las Nieves II in on the side of the highway Saltillo-Matehuala is similar to the area of Galeana, but with greater vegetation cover, while Cañón de Calabacillas and San Lorenzo resemble more the area of Cañón de Reflexiones in Santa Catarina. The area of Paraje Aguajes is very similar to the Cañón de San Isidro.

Table 1. Reports of *Gerrhonotus parvus* obtained in this study and the literature. SRSU: Sul Ross State University. UANL: Universidad Autónoma de Nuevo León.

State	Municipality	Locality	Collection	Catalog number	Latitude (N)	Longitude (W)	Elevation (m)
Nuevo León	Galeana	Ejido Santa Rita	SRSU	5538	24°49'00"	100°05'00"	1650
Nuevo León	Galeana	Ejido Santa Rita	SRSU	5537	24°49'00"	100°05'00"	1650
Nuevo León	Galeana	Ejido Santa Rita	UANL	6208	24°46'60"	100°02'52"	1600
Nuevo León	Los Rayones	Cañón de Mireles	UANL	6220	25°02'08"	100°03'30"	900
Nuevo León	Santiago	Cañón de San Isidro	UANL	5844	25°22'23"	100°18'50"	1650
Nuevo León	Santiago	Cañón de San Isidro	UANL	6221	25°22'23"	100°18'50"	1650
Nuevo León	Santiago	Cañón de San Isidro	UANL	6675	25°22'23"	100°18'50"	1650
Nuevo León	Santiago	Cañón de San Isidro	UANL	6785	25°22'23"	100°18'50"	1650
Nuevo León	Santiago	Cañón de San Isidro	UANL	6797	25°22'23"	100°18'50"	1650
Nuevo León	Santiago	Cañón de San Isidro	UANL	6832	25°22'23"	100°18'50"	1650
Nuevo León	Santiago	Cañón de San Isidro	UANL	6904	25°22'23"	100°18'50"	1650
Nuevo León	Sta. Catarina	Cañón de Reflexiones	UANL	7275	25°37'50"	100°41'58"	1650
Coahuila	Saltillo	Cañón de San Lorenzo	UANL	7729	25°20'11"	100°59'26"	1920
Coahuila	Saltillo	Cañón de San Lorenzo	UANL	7730	25°19'48"	100°58'48"	2065
Coahuila	Saltillo	Cañón de San Lorenzo	UANL	7733	25°20'15"	100°58'42"	2123
Coahuila	Saltillo	Cañón de San Lorenzo	UANL	7734	25°20'15"	100°58'40"	2123

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Authors' Contributions

JBL collected and identified the specimens, JBL and DL wrote the text, CBV prepared the maps, and MNR identified and described the vegetation.

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